

REMARKS

Claims 1-12 and 29 are pending in the application. Claims 1-5, 8, 9, 12 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,936,810 to Nakamoto et al. ("Nakamoto"). Claims 6, 7, 11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamoto in view of U.S. Patent No. 6,175,477 to Lin et al. ("Lin I"). Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamoto in view of U.S. Patent No. 6,185,078 to Lin et al. ("Lin II"). Applicant respectfully traverses the rejections and requests the Examiner to withdraw the pending rejections in light of the following remarks.

A. Amendment to Claim 1

Claim 1 has been amended and the amendment to claim 1 is made to place the Application in condition for allowance or to narrow the issues for appeal. Thus, entry of these amendments is respectfully requested.

B. 35 U.S.C. § 102(b)

Claims 1-5, 8, 9, 12 are patentable under 35 U.S.C. § 102(b) because Nakamoto does not anticipate or disclose a laminate comprising a first section and a second section and a pair of lead layers disposed on a top surface of the second section without bias layer interposed therebetween.

Claims 1-5, 8, 9, 12 were rejected under 35 U.S.C. § 102(b) as being anticipated by Nakamoto. The Office Action asserts that Nakamoto discloses all limitations of claims 1-5, 8, 9, 12. Claim 1 has been amended to include the elements, "the laminate comprising a first section including the narrowed antiferromagnetic layer and a second section substantially wider than the first section in the track width direction" and "the lead layers disposed on a top surface of the second section without the bias layers being interposed therebetween." Applicant submits that claims 1-5, 8, 9, 12 as amended overcome the rejection.

A spin valve thin film magnetic element recited in claim 1 includes the laminate including a pair of nonmagnetic conductive layers, a pair of pinned magnetic layers, a pair of antiferromagnetic layers and a free layer in a thickness direction. One of the antiferromagnetic layers is made narrowed than the free magnetic layer in the track width direction, and therefore,

the laminate comprises a first section including the narrowed antiferromagnetic layer and a second section substantially wider than the first section in the track width direction. A pair of lead layers are extended from both sides of the laminate to the center of the laminate and connected to the laminate through the pair of lead connecting portions. The lead layers are disposed on a top surface of the second section without the bias layers.

The magnetic element recited in claim 1 has advantages that a sensing current flows from a pair of lead layers to the laminate without passing through the antiferromagnetic layer and the bias layers. The component of shunt current through the bias layers is significantly reduced and as a result, the problem of side reading is substantially reduced. In addition, the lead layers are respectively fitted into the top surface of the second section for connection. This decreases steps between the laminate and the lead layers, thereby resulting in decrease in the gap of the spin valve thin film magnetic element. When an insulating layer is further laminated on the spin valve thin film magnetic element, the possibility of producing pin holes or the like in the insulating layer can be prevented and insulating performance can be improved.

On the other hand, Nakamoto does not disclose the laminate having the second section substantially wider than the first section in the track width direction. Nor does Nakamoto disclose the pair of lead layers disposed on the top surface of the second section without the bias layers being interposed therebetween. In Nakamoto, electrodes 14 are disposed on magnetic domain control layers 12. In Nakamoto, the sensing current inevitably flows through the antiferromagnetic layer 40. The antiferromagnetic layer 40 is thick and has the high resistivity, so a significant amount of shunt current through the magnetic domain control layer 12 flows to the laminated film 10. This causes a substantial side reading problem. In addition, because Nakamoto does not have the second section where the electrodes are fitted, it does not prevent the pin holes and improve the insulating performance.

For at least these reasons, Nakamoto does not anticipate or disclose the spin valve thin film magnetic element, as defined in claim 1. Claims 2-5, 8, 9, 12 depend from claim 1 and include all limitations of claim 1, plus additional features. Thus, pending claims 1-5, 8, 9, 12 are patentable over Nakamoto. Applicant respectfully requests the Examiner to withdraw the rejections to claims 1-5, 8, 9, 12.

C. 35 U.S.C. § 103(a)

1. Claims 6, 7, 11

Claims 6, 7, 11 are patentable because the prior arts do not teach or suggest “the laminate comprising a first section including the narrowed antiferromagnetic layer and a second section substantially wider than the first section in the track width direction” and “the lead layers disposed on a top surface of the second section without the bias layers being interposed therebetween.”

Claims 6, 7, 11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamoto in view of Lin I. The current Office Action maintains its position asserted in the previous Office Action issued September 23, 2003¹. The current Office Action also (1) asserts that regarding claim 6, replacing the pinned layers of Nakamoto with the synthetic antiferromagnetic (SAF) pinned layer taught by Lin I is obvious as this would reduce the amount of detrimental stray magnetization reaching the free layer because of the “closed loop” design of the SAF pinned layer; (2) regarding claim 7, it takes official notice that the use of one ferromagnetic layer being thicker than the other ferromagnetic layer in the ferro/nonmag/ferro synthetic pinned layer is old and well known in the art; and (3) regarding claim 11, it asserts that use of PtMn is obvious because of the excellent antiferromagnetic properties and corrosion resistance of PtMn. Applicant submits that the above assertions are incapable of instant and unquestionable demonstration as being well-known. *See* MPEP 2144.3 at 2100-129. In accordance with MPEP 707.05 at 700-88 and 37 CFR § 104 (d)(2), the Applicant respectfully requests that the Examiner provide an affidavit to support each of the rejections made on the basis of Official notice.

Further, Applicant submits that Claims 6, 7, 11 are dependent claims of claim 1 and each claim recites a spin valve thin film magnetic element having the laminate comprising the first section and the second section substantially wider than the first section in the track width direction and the lead layers disposed on a top surface of the second section without the bias layers. As discussed in Section B above, Nakamoto does not disclose the spin valve thin film magnetic element recited in claim 1. Thus, even if Nakamoto is modified with the layers of Lin

¹ Specifically, the Office Action concedes that Nakamoto does not disclose that the pinned magnetic layer comprises a laminate of three layers and that the antiferromagnetic layer comprises any one of XMn alloys and PtX'Mn alloys. However, the Office Action asserts that Lin I discloses a pinned magnetic layer 920 comprising a laminate of at least two ferromagnetic layers 922/924 and a nonmagnetic intermediate layer 926 inserted therebetween and that the antiferromagnetic layer is made of PtMn. Thus, the Office Action asserts that it would have been obvious to one of the ordinary skill in the art to replace the pinned layers and the antiferromagnetic layer of Nakamoto with those disclosed in Lin I.

I, such combination does not teach or suggest the spin valve thin film magnetic element of claims 6, 7, 11.

In addition, Applicant submits that there is no suggestion to replace Nakamoto with the pinned layer disclosed in Lin I. As stated in the Remark submitted January 8, 2004, nowhere in Nakamoto et al. teaches or suggests that the second and third ferromagnetic films 22, 24, 36, 38 can be replaced with the pinned layer disclosed in Lin I. Further, Nakamoto teaches away from such replacement. Nakamoto discloses that “[t]he first ferromagnetic film 18 is thicker than the total thickness of the second ferromagnetic films 22 and 24 and it is approximately two to three times as large as the total thickness.” Nakamoto, Col. 7, lines 34-37, whereas Lin I discloses the pinned layer 920 that is thicker than the free layer 410. Accordingly, there is no suggestion to modify Nakamoto with the pinned layer of Lin I. Nor does Lin I have any suggestion to be combined with the disclosure of Nakamoto. Regarding the antiferromagnetic films, Nakamoto discloses “one selected from alloys of FeMn, NiMn and CrMn or from Oxides of NiO and CoO,” Col. 8, lines 50-53. Because Nakamoto explicitly teaches away from use of PtMn for the antiferromagnetic layers, there is no suggestion to modify Nakamoto’s antiferromagnetic layers with PtMn.

Based on the foregoing, the rejections to claims 6, 7, 11 are improper and should be withdrawn.

2. Claim 10

Claim 10 is patentable under 35 U.S.C. § 103(a) because the prior arts do not teach or describe “the laminate comprising a first section including the narrowed antiferromagnetic layer and a second section substantially wider than the first section in the track width direction” and “the lead layers disposed on a top surface of the second section without the bias layers being interposed therebetween.”

Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamoto in view of Lin II. The Office Action concedes that Nakamoto does not disclose intermediate layers between the bias layers and the lead layers. However, the Office Action asserts that Lin II discloses such intermediate layer and it would have been obvious to the person having the ordinary skill to place the Ta layer disclosed in Lin II between the bias layers and the lead layers of Nakamoto.

Claim 10 is a dependent claim of claim 1, which recites a spin valve thin film magnetic element having the laminate comprising a first section and a second section substantially wider than the first section in the track width direction and the lead layers disposed on a top surface of the second section without the bias layers. As discussed in Section B above, Nakamoto does not disclose the recited magnetic element of claim 1. Even if Nakamoto is modified with Ta layer of Lin II, such combination does not teach or suggest the spin valve thin film magnetic element defined in claim 10.

Further, there is no motivation or suggestion to add the intermediate layer to the laminated film 10 of Nakamoto. Nakamoto does not teach or suggest any intermediate layer. Nakamoto teaches away from addition of the intermediate layer by directly stacking electrodes 14, without the intermediate layer, on the magnetic domain control layers 12. See Col. 7, lines 53-54 and Figure 3. In addition, none of Nakamoto and Lin II suggests that the intermediate layer be added to the specific arrangement of layers of Nakamoto. Nevertheless, the Office Action continues to assert that because use of Ta in the longitudinal biasing/lead sections of spin valve heads is well known in the art to aid in the growth morphology of the subsequent layers, there is suggestion to combine Nakamoto with Lin II. In accordance with MPEP 707.05 at 700-88 and 37 CFR § 104 (d)(2), Applicant respectfully requests the Examiner to provide an affidavit to support the statement on the use of Ta layer, because such statement is not based on the fact that is capable of instant and unquestionable demonstration as being well-known. *See* MPEP 2144.3 at 2100-129.

Based on the above, the rejection to claim 10 is improper and should be withdrawn.

For the foregoing reasons, claims 6, 7, 11 are patentable over Nakamoto in view of Lin I, and claim 10 is patentable over Nakamoto in view of Lin II, either alone or in combination. Applicant respectfully requests the Examiner to withdraw the rejections to claims 6, 7, 10, 11.

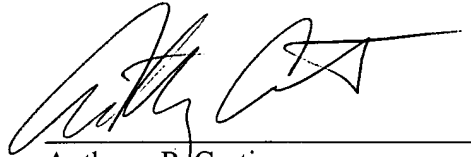
D. New Claim 29

New claim 29 depends directly on claim 1 and so is patentable for at least the same reasons given above in Section B. Claim 29 is patentable for additional reasons that it cites a pair of notch portions. None of the cited references, either alone or in combination, discloses the recited notch portions of claim 29. Thus, claim 29 is patentable and should be allowed.

CONCLUSION

In view of the arguments above, pending claims 1-12 and 29 are patentable. If for any reason, the Examiner is unable to allow the application in the next Office Action and believes that an interview would be helpful to resolve any remaining issues, he is respectfully requested to contact the undersigned attorneys at (312) 321-4200.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Anthony P. Curtis', is written over a horizontal line.

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